

FORM PTO-1390
(REV 10-2000)

U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

ATTORNEY'S DOCKET NUMBER

TRANSMITTAL LETTER TO THE UNITED STATES
DESIGNATED/ELECTED OFFICE (DO/EO/US)
CONCERNING A FILING UNDER 35 U.S.C. 371

2821-211WOUS

U.S. APPLICATION NO. (If known, see 37 CFR 1.5)

09/913984

INTERNATIONAL APPLICATION NO.
PCT/CH00/00086INTERNATIONAL FILING DATE
Feb. 15, 2000PRIORITY DATE CLAIMED
Mar. 08, 1999

TITLE OF INVENTION METHOD AND APPARATUS FOR WELDING METAL SHEETS

APPLICANT(S) FOR DO/EO/US

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This is an express request to promptly begin national examination procedures (35 U.S.C. 371(f)).
4. ☐ The US has been elected by the expiration of 19 months from the priority date (PCT Article 31).
5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
 - a. ☐ is attached hereto (required only if not communicated by the International Bureau).
 - b. ☒ has been communicated by the International Bureau.
 - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☒ An English language translation of the International Application as filed (35 U.S.C. 371(c)(3)).
7. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
 - a. ☐ are attached hereto (required only if not communicated by the International Bureau).
 - b. ☐ have been communicated by the International Bureau.
 - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
 - d. ☒ have not been made and will not be made.
8. ☐ An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☐ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. ☐ An English language translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11 to 16 below concern document(s) or information included:

11. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. ☒ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. ☒ A **FIRST** preliminary amendment.
☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.
14. ☐ A substitute specification.
15. ☐ A change of power of attorney and/or address letter.
16. ☒ Other items or information: FORM PCT/IB/308
Formal Drawings (Pages 1)

U.S. APPLICATION NO. (if known, see 37 CFR 1.5)

INTERNATIONAL APPLICATION NO.

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2821-211WOUS

17. ☒ The following fees are submitted:**BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)) :**

Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO \$1000.00

International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO \$860.00

International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO \$710.00

International preliminary examination fee paid to USPTO (37 CFR 1.482) but all claims did not satisfy provisions of PCT Article 33(1)-(4) \$690.00

International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(1)-(4) \$100.00

ENTER APPROPRIATE BASIC FEE AMOUNT =**CALCULATIONS** PTO USE ONLY

\$ 860.00

Surcharge of \$130.00 for furnishing the oath or declaration later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492(e)).

\$

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE
Total claims	20 - 20 =		X \$18.00
Independent claims	3 - 3 =		X \$80.00

\$

\$

MULTIPLE DEPENDENT CLAIM(S) (if applicable)

+ \$270.00

\$

TOTAL OF ABOVE CALCULATIONS =

\$

☐ Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above are reduced by 1/2.

\$

SUBTOTAL =

\$ 860.00

Processing fee of \$130.00 for furnishing the English translation later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492(f)).

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TOTAL NATIONAL FEE =

\$

Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property

\$ 40.00

+

TOTAL FEES ENCLOSED =

\$ 900.00

Amount to be
refunded: \$
charged: \$

a. ☒ A check in the amount of \$ 900.00 to cover the above fees is enclosed.

b. ☐ Please charge my Deposit Account No. 13-0235 in the amount of \$ to cover the above fees. A duplicate copy of this sheet is enclosed.

c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 13-0235. A duplicate copy of this sheet is enclosed.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

Richard D. Getz
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CityPlace II, 185 Asylum Street
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SIGNATURE:

Richard D. Getz, AUGUST 17, 2001

NAME

36,147

REGISTRATION NUMBER

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K.A. HANSEN
(TYPED NAME OF PERSON MAILING PAPER OR FEE)

K.A. Hansen
(SIGNATURE OF PERSON MAILING PAPER OR FEE)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In the Application of: : Docket No. 2821-211WOUS
Romeo Bucher et al. : Date: 16 August 2001
Serial No.: *Not Yet Known* : G.A.U: *Not Yet Known*
: Examiner: *Not Yet Known*

TITLE: METHOD AND APPARATUS FOR WELDING METAL SHEETS

Commissioner of Patents and Trademarks
Washington, D.C. 20231

PRELIMINARY AMENDMENT

Dear Sir:

Applicants respectfully request preliminary amendments be made to the specification of the United States patent application identified above and provided herewith. The proposed amendments are made to the English translation of the specification of the PCT patent application Serial No. PCT/CH00/00086 from which the present application claims priority. The proposed changes are requested to put the specification in form acceptable to the United States Patent and Trademark Office, and to eliminate any indefiniteness that may exist in the translated version of the PCT specification. Applicants respectfully submit that the requested amendments do not add any new matter into the present application.

Applicants include herewith a redline version of the English translation of the original PCT specification of the parent application showing the proposed amendments, a copy of the same specification with the proposed changes incorporated directly therein, and formal

version of the drawing. Please note that the original application included 10 claims, 2 of which were independent and others of which were multiple dependent. With the present amendment, the specification has been edited to now include original claims 1, 6 and 7, and new claims 11-21, thereby leaving: 14 claims total, 6 independent claims, and 0 multiple dependent claims. The fees are calculated on the amended claim set.

Respectfully submitted,

MCCORMICK, PAULDING & HUBER

By Richard D. Getz
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09/913984
518 Rec'd PCT/PTO 17 AUG 2001

AMENDED VERSION OF THE ORIGINAL
SPECIFICATION WITH PROPOSED AMENDMENTS
INCORPORATED DIRECTLY THEREIN

09/913984 1270
PCT/PTO 17 AUG 2001

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This application claims the benefit under 35 U.S.C. §120 of the
PCT patent application serial number PCT/CH00/00086 filed on 15 February 2000.

Method and Apparatus for Welding Metal Sheets

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BACKGROUND OF THE INVENTION

1. Technical Field

The invention relates to a method and an apparatus for welding sheets of metal in general, and to methods and apparatus for welding sheets of metal that sense the edges of the sheets of metal along which the sheets are to be welded, in particular.

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2. Background Information

It is known to weld so-called tailored blanks, which are then formed into a formed body, from metal sheets which as a rule have dissimilar properties (e.g. thickness, material). Such formed bodies are used e.g. in the motor vehicle industry. Welding of the tailored blanks is performed by, for example, laser or electron-beam welding. In the case of laser-beam welding, in order to obtain a weld seam of sound quality that is fit for the subsequent forming process it is necessary that the sheets when positioned with their edges butted together should have a very small gap between them. This gap should not exceed, for example, 0.08 mm so that welding with a focused laser beam of 0.2 mm diameter can be carried out without any problem. However, when the individual sheet-metal parts are sheared or punched, errors may occur and/or sheets may be distorted because of internal stresses, preventing a gap dimension of 0.08 mm between the sheets from being adhered to. Touching up the edges of all sheets in the course of their fabrication is expensive. Also it is undesirable for space and handling reasons to have to arrange separate machining stations in front of the welding unit. The fundamental problem of the invention, therefore, is to provide a welding method and apparatus for tailored blanks that allow trouble-free welding without the stated drawbacks.

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DISCLOSURE OF THE INVENTION

According to the present invention, a method for welding a pair of metal sheets together along an edge of each metal sheet is provided that includes the steps of: 1)

5 determining a line for each of the edges to be welded using one or more sensors; 2) selecting one of the edges to be welded as a dominant edge and the other edge to be welded as a non-dominant edge; and 3) welding the metal sheets together along the dominant edge and the non-dominant edge. The present invention further includes an apparatus capable of performing the present method.

10 Detecting the edge line of both sheets and selecting one of the edges as a datum edge means that only one of the edges need be machined, and the control device can select the dominant or datum edge in such a way that the machining cost is kept as low as possible. The result is a pairing of the sheets in the welding machine, so that a separate machining station is not needed.

15 In a preferred embodiment, the sheets are not paired off if the edge lines of the two sheets are so different that the machining cost would be excessive. In this case, one of the sheets is discarded and replaced with another. Depending on its edge line, the discarded sheet may be taken out of the production process altogether, or returned to a sheet stack from which it will later be fed to the welding machine again, along with another sheet.

20 These and other objects, features and advantages of the present invention will become apparent in light of the Detailed Description of the Invention, and the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

Embodiments of the invention will now be described in detail by way of example,
25 with reference to Figure 1, which schematically shows a welding apparatus for carrying out the present method.

DETAILED DESCRIPTION OF THE INVENTION

Figure 1 schematically shows a welding apparatus 1 in which two sheets 2 and 3 to be welded together by means of a laser beam 5 are arranged. In the position shown, the sheets are held with their welding edges 2' and 3' spaced apart from one another prior to entry into the welding zone. The sheets are lying on a conveyor device (not shown) by means of which they can be carried through the welding zone in the direction shown by arrow A. Laterally the sheets are held by guides 11. In the spaced-apart position shown, each sheet edge 2' and 3' can be tracked by a sensor 6, 7 to detect its precise line. Instead of two sensors, it would also be possible to provide a single sensor which would sense first one edge and then the other.

Instead of a mechanical sensor, an optical edge-line detecting system, or one based on some other sensing principle, could be provided. The sensors 6, 7 are guided along the respective edges by traversing means which is not shown, and signal the line of the respective edges to a control unit 9. The control unit 9 records the precise lines of the two edges, and compares them with each other. The control unit 9 is able to determine from the line of the edges whether the gap will be within the permissible maximum when the edges are brought together for welding. If this is confirmed to be the case, the two sheets can be pressed together, without further reworking, by the guides 11, which move in the direction shown by the arrows B, and in this abutting position the two sheets are traversed in the direction of the arrow A and welded under the laser beam 5, which impinges on the gap from above or from below. If the line of the edges 2' and 3' is other than straight (e.g., as shown in Figure 1), the laser beam is made to track the gap by displacement in the direction shown by arrow C. In this case, the control unit for the laser beam 5, which may be the control unit 9 or a separate control unit connected to the control unit 9, may use the edge line detected by means of the sensors as the basis for controlling the laser beam 5. This control based upon the actual line of the edge or gap may replace or supplement the optical gap detection which has normally been used hitherto.

If, however, the control unit 9 finds, at the edge detection stage, that the gap cannot be kept within the permissible maximum if the edges 2' and 3' are joined together in their existing form, the control unit 9 identifies one of the edges as the dominant or datum edge, and controls the adjustment of the other edge by a machining tool 10 to match it to the datum

edge. The datum 8 is chosen so as to incur the smallest possible amount of machining for the other edge. The machining tool provided may be, for example, a roller 10 which presses on the edge to be machined so that the edge yields under pressure and is deformed accordingly. In this case the machining tool 10 may be displaced along the edge, applying varying pressure thereto. The corresponding mechanical, pneumatic or hydraulic actuating device for the roller 10 is not shown in the figure. Pressing with a roller is the preferred method of machining, as it produces no swarf, and the squeezing of the affected sheet edge does not hinder, and may possibly even assist, the welding process. On its own, pressing can produce an alteration to the edge line of around 1 /10 mm, which is sufficient for the present purpose. Nevertheless, other known machining methods, such as milling or grinding for example, may also be used. When the machined edge has been matched to the datum edge, the machining tool 10 can be withdrawn, and the two sheets are, as before, pressed together by the positioning means 11 in the direction shown by arrows B, and led by the conveyor means under the laser beam 5 in the direction shown by arrow A. In this case also, the movements of the laser can be controlled on the basis of the edge data.

If, after recording the lines of the two edges, the control device 9 finds that machining the two sheets with the tool 10 would fail to bring them sufficiently into register within a specified time, for the permissible gap to be adhered to, machining is not initiated, and one sheet is discarded. This can be done by running one sheet out of the welding machine in the direction shown by arrow A, or in the opposite direction or sideways from the welding machine. The discarded sheet can be scrapped if the position of its edge lies outside a specified maximum deviation from a required edge position. If this is not the case, then the discarded sheet can be conveyed back to a sheet stack from which it will later again pass into the welding machine, along with another sheet. In this case, the combination of the two edge lines may result in a pairing whereby the permissible gap can be comfortably adhered to.

The method and apparatus which have been indicated permit simple and rapid pairing of sheets for the fabrication of tailored blanks in the welding machine. The method is especially preferred where the gap, or the line of the weld seam, is not straight.

Although this invention has been shown and described with respect to the detailed embodiments thereof, it will be understood by those skilled in the art that various changes in

form and detail thereof may be made without departing from the spirit and the scope of the invention.

What is claimed is:

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1. A method for welding metal sheets to form tailored blanks, characterized in that the edge line of both sheets is detected in the welding machine, the edge line of one of the sheets is identified as the dominant edge line and the other edge is reworked to match it to the dominant edge, and in that the sheets are then welded.

6. An apparatus for welding metal sheets to form tailored blanks, characterized by at least one detection device for detecting the edge line of the sheet edges to be welded, a control unit for identifying one of the detected edges as the dominant edge and for transmitting control signals to at least one machining unit arranged in the apparatus for machining the non-dominant edge.

7. An apparatus according to Claim 6, characterized in that the control unit is configured for the transmission of control signals to a discard unit whereby one of the sheets can be discarded from the apparatus before welding takes place.

11. (New) A method for welding a pair of metal sheets together along an edge of each metal sheet, comprising the steps of:

sensing the edge to be welded of each metal sheet;

determining a line for each of the edges to be welded;

selecting one of the edges to be welded as a dominant edge, and the other edge to be welded as a non-dominant edge;

reworking the non-dominant edge to substantially match the dominant edge;

welding the metal sheets together along the dominant edge and the non-dominant edge.

12. (New) The method of claim 11, further comprising the step of discarding the metal sheet with the non-dominant edge if the line determined for the non-dominant edge deviates more than a predetermined amount.

5 13. (New) The method of claim 11 wherein the step of reworking the non-dominant edge to substantially match the dominant edge includes machining the non-dominant edge.

14. (New) The method of claim 13, wherein the machining includes pressing with a pressing tool.

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15. (New) The method of claim 11 wherein the step of welding the metal sheets together along the dominant edge and the non-dominant edge includes guiding a welding beam at least in part based upon the line of the dominant edge.

15 16. (New) A method for welding a pair of metal sheets together along an edge of each metal sheet, comprising the steps of:

determining a line for each of the edges to be welded using one or more sensors;

selecting one of the edges to be welded as a dominant edge, and the other edge to be welded as a non-dominant edge;

20 determining if a gap between the edges to be welded exceeds a predetermined amount; replacing the metal sheet having the non-dominant edge with a replacement metal sheet;

determining a line for the edge of the replacement sheet to be welded and repeating the step of determining a gap and also the step of replacing the metal sheet having the non-

25 dominant edge, if necessary, until the gap is equal to or less than the predetermined amount;

welding the metal sheets together along the dominant edge and the non-dominant edge.

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17. (New) An apparatus for welding metal sheets together along an edge of each metal sheet comprising:

at least one detection device for detecting an edge line of each sheet;

a control unit for identifying a metal sheet edge to be welded as a dominant edge, and

5 another metal sheet edge as a non-dominant edge, and

a means for reworking the non-dominant edge.

18. (New) The apparatus of claim 17, wherein the means for reworking the non-dominant edge includes at least one pressing tool.

19. (New) The apparatus of claim 17, wherein the control unit is capable of transmitting control signals to a discard unit to discard a metal sheet from the apparatus prior to welding.

20. (New) The apparatus of claim 17, wherein the control unit includes means for controlling a welding device.

21. (New) An apparatus for welding metal sheets together along an edge of each metal sheet comprising:

at least one detection device, including at least one sensor, for detecting an edge line of each sheet;

a discard unit for discarding a metal sheet from the apparatus prior to welding;

a means for welding the metal sheets together;

a control unit for identifying one of the metal sheet edges to be welded as a dominant edge and the other metal sheet edge to be welded as a non-dominant edge, wherein the control unit further includes means for transmitting control signals to the discard unit, and for transmitting data for use in controlling the means for welding; and

a means for reworking the non-dominant edge.

ABSTRACT OF THE DISCLOSURE

A method for welding a pair of metal sheets together along an edge of each metal sheet is provided that includes the steps of: 1) determining a line for each of the edges to be welded using one or more sensors; 2) selecting one of the edges to be welded as a dominant edge and the other edge to be welded as a non-dominant edge; and 3) welding the metal sheets together along the dominant edge and the non-dominant edge. The present invention further includes an apparatus capable of performing the present method.

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FIG. 1

Method and Apparatus for Welding Metal Sheets

The invention relates to a method according to the introductory part of Claim 1. The invention further relates to an apparatus according to Claim 6.

It is known to weld so-called tailored blanks, which are then formed into a formed body, from metal sheets which as a rule have dissimilar properties (e.g. thickness, material). Such formed bodies are used e.g. in the motor vehicle industry. Welding of the tailored blanks is performed e.g. by laser- or electron-beam welding. In the case of laser-beam welding, in order to obtain a weld seam of sound quality that is fit for the subsequent forming process it is necessary that the sheets when positioned with their edges butted together should have a very small gap between them. This gap should not exceed e.g. 0.08 mm so that welding with a focused laser beam of 0.2 mm diameter can be carried out without any problem. However, when the individual sheet-metal parts are sheared or punched, errors may occur and/or sheets may be distorted because of internal stresses, preventing a gap dimension of 0.08 mm between the sheets from being adhered to. Touching up the edges of all sheets in the course of their fabrication is expensive. Also it is undesirable for space and handling reasons to have to arrange separate machining stations in front of the welding unit. The fundamental problem of the invention, therefore, is to provide a welding method and apparatus for tailored blanks that allow trouble-free welding without the stated drawbacks.

This problem is solved for a method and an apparatus of the kind stated at the outset, by the characterizing features of Claim 1 and Claim 6 respectively.

Detecting the edge line of both sheets and selecting one of the edges as datum edge means that only one of the edges need be machined, and the control device can select the dominant or datum edge in such a way that the machining cost is kept as low as possible. The result is a pairing of the sheets in the welding machine, so that a separate machining station is not needed.

In a preferred embodiment, the sheets are not paired off if the edge lines of the two sheets are so different that the machining cost would be excessive. In this case, one of the sheets is discarded and replaced with another. Depending on its edge line, the discarded sheet may be taken out of the production process altogether, or returned to a sheet stack from which it will later be fed to the welding machine again, along with another sheet.

Embodiments of the invention will now be described in detail by way of example, with reference to the figure, which shows, highly schematically, a welding apparatus for carrying out the method.

The figure shows, highly schematically, a welding apparatus 1 in which two sheets 2 and 3 to be welded together by means of a laser beam 5 are arranged. In the position shown, the sheets are held with their welding edges 2' and 3' spaced apart from one another prior to entry into the welding zone. The sheets are lying on a conveyor device (not shown) by means of which they can be carried through the welding zone in the direction A. Laterally the sheets are held by guides 11. In the spaced-apart position shown, each sheet edge 2' and 3' can be tracked by a sensor 6, 7 to detect its precise line. Instead of two sensors, it would also be possible to provide a single sensor which would sense first one edge and then the other. Instead of a mechanical sensor, an

optical edge-line detecting system, or one based on some other sensing principle, could be provided. The sensors 6, 7 are guided along the respective edges by traversing means which are not shown, and signal the line of the respective edges to a control unit 9. This unit records the precise lines of the two edges, and compares them with each other. The control unit 9 is able to determine from the line of the edges whether the gap will be within the permissible maximum when the edges are brought together for welding. If this is confirmed to be the case, the two sheets can be pressed together, without further reworking, by the guides 11, which move in the direction of the arrows B, and in this abutting position the two sheets are traversed in the direction of the arrow A and welded under the laser beam 5, which impinges on the gap from above or from below. If the line of the edges 2' and 3' is - as indicated in the

figure - other than straight, the laser beam is made to track the gap by displacement in the direction of the arrow C. In this case, the control unit for the laser beam 5, which may be the control unit 9 or a separate control unit connected to the control unit 9, may use the edge line detected by means of the sensors as the basis for controlling the laser beam 5. This control based upon the actual line of the edge or gap may replace or supplement the optical gap detection which has normally been used hitherto.

If, however, the control unit 9 finds, at the edge detection stage, that the gap cannot be kept within the permissible maximum if the edges 2' and 3' are joined together in their existing form, the control unit 9 identifies one of the edges as the dominant or datum edge, and controls the adjustment of the other edge by a machining tool 10 to match it to the datum edge. The datum 8 is chosen so as to incur the smallest possible amount of machining for the other edge. The machining tool provided may be e.g. a roller 10 which presses on the edge to be machined so that the edge yields under pressure and is deformed accordingly. In this case the machining tool 10 may be displaced along the edge, applying varying pressure thereto. The corresponding mechanical, pneumatic or hydraulic actuating device for the roller 10 is not shown in the figure. Pressing with a roller is the preferred method of machining, as it produces no swarf, and the squeezing of the affected sheet edge does not hinder, and may possibly even assist, the welding process. On its own, pressing can produce an alteration to the edge line of around 1/10 mm, which is sufficient for the present purpose. Nevertheless, other known machining methods, such as milling or grinding for example, may also be used. When the machined edge has been matched to the datum edge, the machining tool 10 can be withdrawn, and the two sheets are, as before, pressed together by the positioning means 11 in the direction of the arrows B, and led by the conveyor means under the laser beam 5 in the direction of the arrow A. In this case also, the movements of the laser can be controlled on the basis of the edge data.

If, after recording the lines of the two edges, the control device 9 finds that machining the two sheets with the tool 10 would fail to bring them sufficiently into register, within a specified time, for the permissible gap to be adhered to, machining is not initiated, and one sheet is

discarded. This can be done by running one sheet out of the welding machine in direction A, or in the opposite direction, or sideways from the welding machine. The discarded sheet can be scrapped if the position of its edge lies outside a specified maximum deviation from a required edge position. If this is not the case, then the discarded sheet can be conveyed back to a sheet stack from which it will later again pass into the welding machine, along with another sheet. In this case, the combination of the two edge lines may result in a pairing whereby the permissible gap can be comfortably adhered to.

The method and apparatus which have been indicated permit simple and rapid pairing of sheets for the fabrication of tailored blanks in the welding machine. The method is especially preferred where the gap, or the line of the weld seam, is not straight.

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Claims

1. Method for welding metal sheets (2, 3) to form tailored blanks, characterized in that the edge line of both sheets is detected in the welding machine, the edge line of one of the sheets is identified as the dominant edge line and the other edge (2', T) is reworked to match it to the dominant edge, and in that the sheets are then welded.
2. Apparatus according to Claim 1, characterized in that a sheet is discarded before reworking takes place, if the deviation of its edge from the dominant edge exceeds a predetermined amount.
3. Apparatus according to Claim 1 or Claim 2, characterized in that the edges are sensed by means of at least one sensor (6, 7) to determine the edge line.
4. Apparatus according to Claims 1 to 3, characterized in that the edge requiring reworking is machined by pressing.
5. Apparatus according to any one of Claims 1 to 4, characterized in that guidance of the welding beam is governed by, or is in part governed by, the detected dominant edge line.
6. Apparatus for welding metal sheets (2, 3) to form tailored blanks, characterized by at least one detection device (6, 7, 9) for detecting the edge line of the sheet edges (2', 3') to be welded, a control unit (9) for identifying one of the detected edges as the dominant edge and for transmitting control signals to at least one machining unit (10) arranged in the apparatus for machining the non-dominant edge.
7. Apparatus according to Claim 6, characterized in that the control unit is configured for the transmission of control signals to a discard unit whereby one of the sheets can be discarded from the apparatus before welding takes place.

8. Apparatus according to Claim 6 or Claim 7, characterized in that the detection device comprises at least one sensor (6, 7).
9. Apparatus according to any one of Claims 6 to 8, characterized in that the machining device comprises at least one pressing tool, in particular a roller (110).
10. Apparatus according to any one of Claims 6 to 9, characterized in that the control unit (9) forms the welding beam control or is configured for transmission of data to such a control.

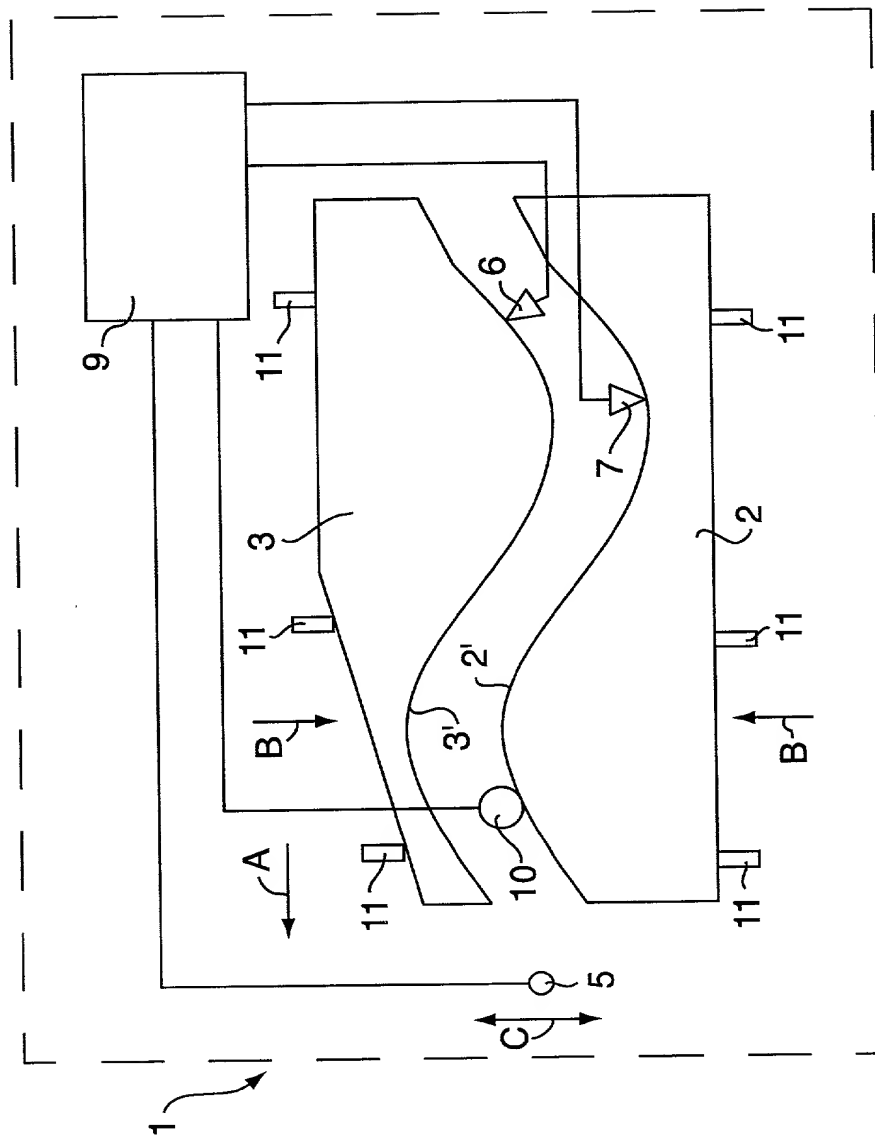
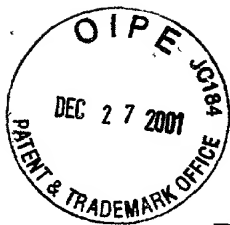


FIG. 1

TOTAL 4861650

DECLARATION AND POWER OF ATTORNEY

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

METHOD AND DEVICE FOR WELDING SHEETS

the specification of which

(Check ___ is attached hereto.
one)

x was filed on February 15, 2000

as Application Serial No. PCT/CH00/00086

and was amended on _____
(if applicable)

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose to the U.S. Patent and Trademark Office all information known to be material to the patentability of this application in accordance with Title 37, Code of Federal Regulations, §§1.56 and 1.63(d).

I hereby claim foreign priority benefits under Title 35, United States Code §119(a)-(d) or (f), or 365(b) of any foreign application(s) for patent or inventor's or plant breeder's right certificate(s), or 365 (a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below any foreign application for

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patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s):

PCT/CH00/00086 PCT		15 February 2000	Priority Claimed
423/99	Switzerland	8 March 1999	YES
(Number)	(Country)	(Day/Month/Year Filed)	Yes/No

I hereby claim the benefit under Title 35, United States Code §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code §112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations §§1.56 and 1.63(d) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

(Application Serial No.)	(Filing Date)	(Status - Patented, pending, abandoned)
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19 I hereby appoint Donald K. Huber, Registration No. 18,686; Theodore R. Paulding, Registration No. 19,294; John C. Hilton, Registration No. 22,965; Frederick J. Haesche, Registration No. 24,529; John C. Linderman, Registration No. 24,420; J. Kevin Grogan, Registration No. 31,961; Arthur F. Dionne, Registration No. 23,093; Daniel G. Mackas, Registration No. 38,541; Richard R. Michaud, Registration No. 40,088; Marina F. Cunningham, Registration No. 38,419; Susan C. Oygard, Registration No. 42,969; Nicholas J. Tuccillo, Registration No. 44,322; Stephen P. Scuderi, Registration No. 42,136; Wm. Tucker Griffith, Registration No. 44,726; Mary-Jacq Holroyd, Registration No. 41,846; Shirley S. Ma, Registration No. 44,216; Richard D. Getz, Registration No. 36,147; Donald J. MacDonald, Registration No. 42,823, and William B. Gowanlock, Registration No. 41,794, all of the firm of McCormick, Paulding & Huber LLP, CityPlace II, 185 Asylum Street, Hartford, Connecticut 06103-4102, telephone (860) 549-5290, as my attorneys to prosecute this application, to make alterations and amendments therein, to receive the patent and all

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correspondence relating to this application, and to transact all business in the U.S. Patent and Trademark Office connected therewith, and the said attorneys are hereby given full power of substitution and revocation.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Romeo BUCHER

200

Bruno KAEGI

Full name of sole or first inventor

Full name of second joint inventor,
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